Science

PRIMARY 4

2025 – 2026 FIRST TEARM

MISS: WESAM GAD

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Adaptation

- Living organisms face some problems during life as the climate (cold or hot) and water amount.
- They must adapt with these changes to survive.

- in hot sunny day, organisms protect themselves by different ways: -

- Starred agama lizard: - live in desert
  - Keep itself cool by finding shaded area.

- Palm leaves: covered with waxy layer to protect them.

- Human being:
  - using umbrella and light clothes.

Adaptation: some changes that help living organisms to survive and reproduce in the ecosystem.

ecosystem: area that contain living and non-living things interact with each other.

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Adaptation in animals

1 - Penguin

- Penguins live in Antarctica (very cold place).

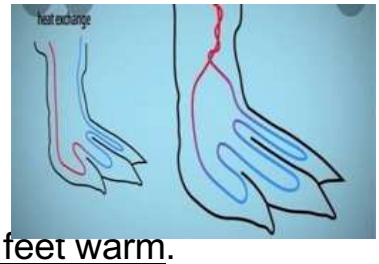
Penguin body has: -

1. ***Insulating fat layer.***
2. ***Thick feathers.***

- To keep its body warm. (trap warm air).

- Penguin feet have no feathers, but also don't freeze. G.R?

-Due to the way of blood movement (penguin feet have blood vessels).



- Cold blood moves up from feet to body.
- Warm blood moves down from body to feet.
- Warm vessels weave around cold ones to keep their feet warm.

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Camouflage

- ***It's a way of adaptation in which:***
  - Organism use the color of surrounding to hide:
  - From predators: to not be hunted.
  - from preys: to hunt them.

1) Polar bear: *- (arctic or polar climate)*

- It has ***white*** and ***thick*** fur. G.R?

White to blend in with snow, ***Thick*** to keep its body warm.

---

2) Brown and dark bear: *-(forest)*

they Have ***dark or brown fur*** to help them hide among trees during hunting.

---

3) Caracal and fennec fox: *-(desert)*

- They have **a *sandy colored fur*** to help them hide in desert.

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4) Some types of lizards live in desert.

- They have ***colorful scales*** to make them hidden among rocks.

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Work sheet

Choose the correct answer :

1. Which of the following adaptations help the animal to blend in with its surrounding environment?

A- Layer of fat.

B- Color of fur.

C- Thickness of skin.

D- Kind of food.

2. The different colors of fur in different types of bears help them to

1) respire in their environments.

2) adapt their habitats.

3) communicate with other animals.

4) look for shade areas.

3. Which of the following sentences doesn't represent the camouflage adaptation?

A. Dense feathers of penguins.

B. White fur of polar bears.

C. Colored scales of some lizards.

D. Sandy-colored fur of fennec foxes.

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Give a reason for the following :

Some types of lizards that live in rocky areas have colorful scales.

……

Put (v) or (X) :

1. Bodies of fennec foxes, penguins and caracals are adapted to live in extreme hot climate.
2. Penguins have special blood vessels in their feet that help them survive in polar regions.
3. The brown fur of the polar bear helps it to blend in with snow.

What happens if ...?

Forest bears are coated with white fur.

……

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2) types of adaptation

Structural (physical) adaptation: change in ***the structure*** of body help the organism to survive.

(body parts)

Examples: -

{sandy colored fur of fennec fox - blood vessels in penguin –teeth of cow}

Behavioral adaptation: change in the ***behavior*** of group of organisms to survive.

(animal's actions)

Examples: -

{panting – migration of birds at certain time}

Adaptation in animals: -

1-Fennec fox: -it lives in hot and dry desert.

Structural adaptation	Behavioral adaptation
1. It has tan-colored fur: - To hide in desert. - To protect it from sun.	**1-*It pants like dogs*** - to cool its body
2. It has a large ear - to cool its body by losing heat.	**2- *It Live in burrows*** - to stay cool at day.
3. It has *special shape of ears* for good hearing sense. - **For hunting**	**3-*Eat different kinds of food*. G.R?** -because it's hard to find food in desert. ***(insects – fruit – roots – remains of prey)***

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2- *Arctic fox:* live in tundra. (dry desert) - Temperature (50°C below zero) in winter.

Structural adaptation	Behavioral adaptation
. It has *thick fur* - **to** stay warm in cold climate. **. His fur color changes by season** - ***White*** in winter - ***brown*** in summer	***1- Live in burrows*** - to stay warm at night.
. It has a *short ears and legs* - to stay warm.	**2- *Eat different kinds of food*. G.R? -** because it's hard to find food in desert. **(*insects – fruit – roots – remains of prey)***
. It has *special shape of ears* for good hearing sense.	

3- Bull shark: -

- Most sharks live only in salt water.
- Bull shark can live in both fresh and salt water, so it can find food easily in *fresh water* as there is no other sharks there.

Structural adaptation	Behavioral adaptation
1- Can live in fresh water.	***1- Eat different kinds of food*** As it lives in Fresh and salt water
2- It has a dark back and white belly To hide from preys by camouflage strategy (countershading) .	***2- Hunt at day and night*** - So its prey cannot predict time of next attack.
3- It has sharp teeth: - - To cut its prey.	

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4-Panther chameleon.) tropical rain forest(

- **There are many types of lizard in different environments.**
- **Lizards from reptiles. Their body covered with scales**

Structural adaptation	Behavioral adaptation
1. It has *brightly colored scales.* - To hide among leaves and flowers.	I-t doesn't have teeth or claws but in danger cases it can defen itself by: - **1- Blow its body with air.** **2- Open its mouth wide.** **3-Change the color of scales.** **-to** scare its enemies.
2. its eyes move in opposite directions. - *One eye search for food and the other eye looks out for danger.*	
3. It has *very long sticky tongue*. - For hunting	
4. V-shaped feet and tail like hand. To stick with branches and catch things	

-

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Work sheet

Write the scientific term of each of the following :

1- A change in the body structure of a living organism to survive.

(.....)

2- A change in the behaviors or acts of a living organism to survive.

(.....)

3- A type of foxes has a tan-colored fur.

(.....)

4- A way by which fennec fox cools itself like dogs.

(.....)

5- A type of foxes that changes its fur color between winter and summer seasons. (.....)

6- A lizard that has different bright colored scales to provide camouflage in its environment and has V-shaped feet. (.....)

7- A shape of feet by which a panther chameleon holds tightly to branches of trees. (.....)

8- A feature in the bull shark, in which the upper surface of its body is darker than its lower surface. (.....)

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3) ***adaptation in plants***

- **plants grow every place sunlight can reach even in the bottom of sea.**
- **plants have structural and behavioral adaptation to survive in environments.**

1- Acacia tree. (umbrella shape)

- It grows in savannah forest in south Africa.
- Savannah forest is a grassland with mild temperature.
- It characterized by lack of water during dry season (last for 6 months).
- Only acacia trees can be seen among grass. G.R?
- Due to drought conditions.

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Structural adaption	Behavioral adaption
1- Very long root (taproot) - Root extends deeply up to 35 meters search for water.	1- Produce poison - That make leave's taste very bad.
2- Very long trunk. - So, animals can't reach leaves except giraffe. - Store water as camel hump store fat.	2- Send smelly message to warn another acacia trees to produce the same poison.
3- Tiny leaves. To hold water and absorb sunlight. 4- Sharp spines to protect it from animals.	

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2) kapok tree (umbrella shape)

grows in ***amazon rainforest in Brazil.***

n amazon, it's easy to find water as it rains most of the year.

's hard for plants to reach ***sunlight.***

here are ***soggy soil*** and ***strong wind.***

ees grow up to ***70*** meters.

Structural adaptation	Behavioral adaptation
1. Large and wide roots (buttress roots) - Roots grow high on trunk up to 5 meters to hold the tree firmly.	1- It Sends *smelly message in air* to attract bats to help it in reproduction.
2. It has hand-shaped leaves. - To allow wind move gently through it.	2- It uses wind to carry its ***fluffy yellow seeds.***

Plants differ in shape of their root, stem and leaves to adapt with the conditions of their environments.

If the plant placed in different environment,

- It may die or may adapt with the new conditions to survive.

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- ***Botanist***: the scientist who study plants.

Plant	Habitat	Adaptation	Help plant to: -
Mangrove.	Salt water	Long and strong roots.	Resist strong waves.
Waterlily.	Wetland	Wide floating leaves.	Absorb a big amount of sunlight.
Palm tree.	desert	Thick root and small leaves.	Resist strong wind.
Pine tree	Snow	- Triangular shape. - Short branches. - Needle leaves.	- Allow snow slide. - Branches don't break - Prevent losing water.
Barbary fig	Desert	Sharp spines	- Prevent animal from eating leaves.

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Work sheet

Choose from column (B) what suits it in column (A) :

(A)	(B)
1) Long and strong roots 2) Wide leaves 3) Needle shaped leaves 4) Sharp spines 5) Hand-shaped leaves	a. prevent animals from eating barbary fig. b. make mangrove tree resists the water waves. c. carries the kapok tree's fluffy yellow seeds across the forest. d. allow wind to move more gently through the leaves of kapok tree. e. allow water lilies absorb large amount of sunlight. f. prevent the loss of water in pine tree.

1- …….. 2- ……... 3 - ……... 4- ……... 5- ……...

Give reasons for :

1- Acacia tree has very long trunk.

……

What happens if ….?

1- Palm tree has thin trunk and long leaves.

……..

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4) Digestive system

The body is consisting of group of systems; each system has a specific function

System is (*group of organs that working together to perform specific function*)

We eat food to get energy.

- To do activities (walking – running and talking)
- To do internal function (heart beats 100,000 times – thinking …).

Digestive system and respiratory system are working together to get energy.

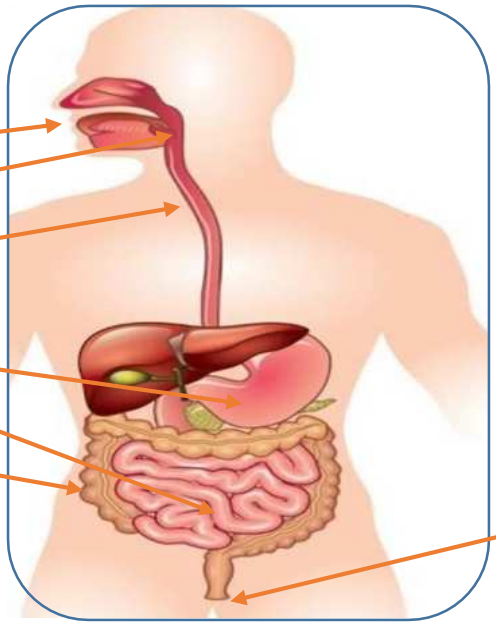
Digestive system: -

- The system responsible for breaking down food into small parts.

Digestion process:

- **The process of breaking down food into small parts to be absorbed inside the body.**

Organs of digestive system: -



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- Digestive system starts with ……. and ends with ……

1- Mouth: contain teeth, tongue and saliva.

Teeth	Crush food during chewing.
Tongue	Mix food with saliva.
Saliva	- Help in digestion. - Facilitate swallowing (moistens food).

2- Esophagus:

Long muscular tube used to transfer food from throat to stomach.

3- Stomach:

- Muscular organ mix food with stomach acid and digestive juices.
- Food become soupy liquid inside stomach.
- Food stays inside stomach few hours then moved to small intestine.

4- Small intestine: -

- Long winding tube more than six meters.
- Pancreas and liver pour juices into small intestine.
- It Breaks down food into simple nutrients.
- Complete the digestion and absorb digested food by inner walls.

5- Large intestine: -

- A tube that starts with end of small intestine and end with anus.
- Absorb water from undigested material so they become solid wastes that come out through anus.

.To keep the digestive system healthy: -

1. Chewing food well.
2. Don't eat much fast meals.
3. Drink a lot of water.
4. Practice sports regularly.

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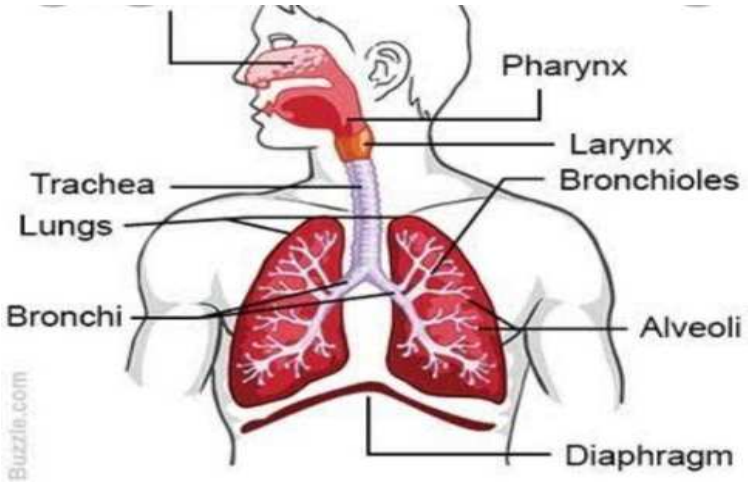
Respiratory system

It is the system responsible for ***breathing.***

It supplies body with **oxygen** gas and gets rid of ***carbon dioxide*** gas.

It consists of: -

1- Nose.
2- Throat.
3- Trachea.
4- Two lungs.
5- Diaphragm.



How respiratory system work?

1- Air enter the body through **nose** or **mouth** then down to **throat.**
2- air passes through **trachea** into **two lungs.**
3- Trachea is branched into **two bronchi** inside lungs.
4- two bronchi are divided into smaller tubes called **bronchioles.**
5- at the end of each bronchiole, there are **air sacs (alveoli)** to extract oxygen from air surrounded by blood vessels.

Respiration process : pulling air with oxygen gas into the body and pushing air with carbon dioxide gas out of the body.

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We cannot store more oxygen inside our bodies
so we must keep take in new oxygen.
Carbon dioxide is a ***harmful*** gas, so we must expel it out of the body.

- Oxygen enters the lungs during *inhalation* and blood transfer it to all the body.
  Respiration process include ***inhalation*** **a**nd ***exhalation.***

- **Inhalation** and **exhalation** are directed by large muscle at the base of ***ribs*** called ***diaphragm.***

Inhalation	Exhalation
Diaphragm ***contract*** and ***moves down.***	Diaphragm ***relax*** and ***moves up.***
Size of chest ***increase.***	Size of chest ***decrease.***
Air rich in ***oxygen.***	Air rich in **carbon dioxide.**

- ***How can we keep respiratory system healthy?***
  1.breathing clear air. 2. Avoid smoking
  3.eating fruits rich in *vitamin C* such as ***orange*** *and* ***guava.***

How fish breath.

- *Fish can live under water but human not.*
- *Fish have gills to breath instead of lungs in human.*
- *Gills found on both sides of head under bony flaps*
  That can open and close.
- *Gills considered a..... adaptation to extract oxygen from water.*
- *As human need clean air also fish need clean water to breath.*

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Work sheet

Choose the correct answer:

1- The trunk in acacia tree stores …… as the hump in the camel stores …….. .

A. oil - water. B. water – milk. C. oil – milk D. water - fat.

2- All of the following sentences are correct about stomach, except …….. .

A. it has teeth and tongue.
B. it receives the food from esophagus.
C. food changes into soupy liquid inside it.
D. it contains an acid.

3- All of the following organs belong to the respiratory system, except …….. .

A. nose. B. two bronchi. C. two lungs. D. stomach.

Give a reason for the following:

Saliva is very important in your mouth.

……

Put (V) or (X) :

1. Caracal and fennec fox can hide in the desert as they have white-colored fur. ( )
2. Bodies of starred agama and panther chameleon are covered with scales. ( )
3. Digestion process begins in the stomach with the help of saliva. ( )

What happens if ...?

The small intestine was not supplied with blood vessels in the human body.

……..

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Human change the environment.

There are two types of change according to occurrence time: -

1- *Slow change*, so the organisms have time to adapt over generations.
2- *Rapid change,* so the organism can move, disappear, die or even extinct.

- Changes that occur by nature: -
    1. Change in temperature.
    2. Change in Rainfall amount.
    3. Severe weather (wind).
    4. Wildfire and floods.

Ecosystem Changes that caused by human activities: -

1. Cutting down forests.
2. Clearing grasslands and ***building communities.***
3. Introducing plants and animals not belong to the ecosystem.
4. Cars and factories exhausts cause *(air pollution).*
5. Throwing wastes in water *(water pollution).*
6. Watering soil with polluted water *(soil pollution).*

Impacts of human activities: -

1- On animals, they can survive by moving to better place.
2- Plants, they depend on their seeds to land and grow in suitable place.
3- On human: -
    - Hard to breath because of air pollution.
    - Hard to find drinking water (water pollution).
    - Crops affected by air, water and soil pollution.
    - Exposure to high level of air pollution for long time can damage the lungs, and cause asthma and heart problems.

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Work sheet

Correct the underlined words :

1. Fish use gills to extract <u>carbon dioxide</u> gas from the water.

(……..)

2. <u>Air</u> enters the mouth of a fish and then passes across the gills.

(……..)

3. Blood vessels of lungs and gills are similar in carrying <u>carbon dioxide gas</u> to all the body parts. (…. .....)

4. Gills are unique <u>behavioral adaptation</u> that allow fish to breathe under water. (…. .....)

5. When an ecosystem is completely polluted, <u>animals only</u> are affected. (…. .....)

6. <u>Water pollution</u> is caused due to the smog of factories and cars.

(……..)

Give a reason for the following:

1- Gills are very important organ for fish.

……..

2- Cars and factories exhausts cause breathing problems.

……..

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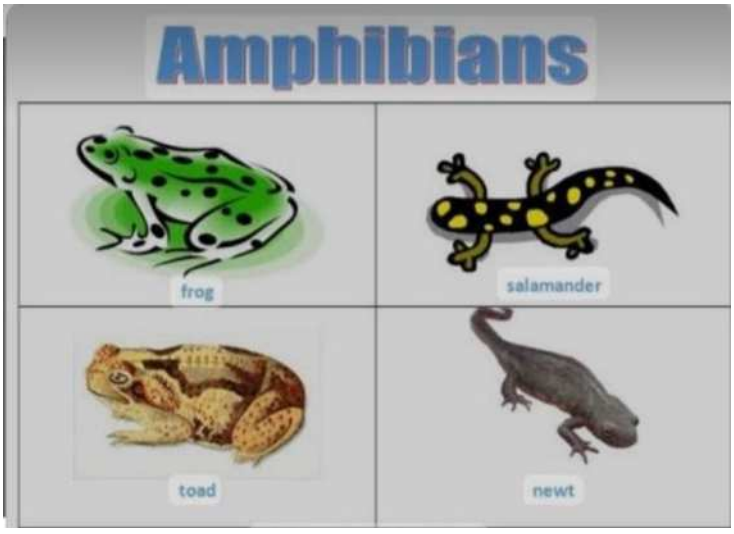
How can we restore the ecosystem?

- Replanting forests.
- Removing pollutants from air and water.
- Preserving animals and plants in their ecosystems.

Amphibians



- They are small animals such as frogs, toads and salamanders.
- They can live in moist environments like rainforests and ponds.
- Like human, adult amphibians can breath using lungs.
- But also they con survive under water using their skin to extract oxygen.
- They are very sensitive to any pollution and there are about 90 species become extinct in last 20 years.
- 124 species of amphibians are endangered.
- Amphibians considered as endangered species so we should protect them by removing pollutants.

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Work sheet

Put (V) or (X) :

1- Amphibians include frogs and salamanders. ( )

2- The natural habitat of amphibians is rainforest, while that of panther chameleon is desert. ( )

3- The number of amphibians increases in the last few years, due to restoring of its ecosystem. ( )

4- Arctic foxes and amphibians cannot be found in the same habitat. ( )

5- Salamanders and fish can breathe in air through lungs. ( )

6- In the habitat of amphibians, we can find some types of reptiles. ( )

7- Scientists try to save golden frogs from extinction. ( )

8- Clean water and air are very important for respiration process in amphibians. ( )

9- It is important to advice people not to throw waste materials in waterways to save amphibians' life. ( )

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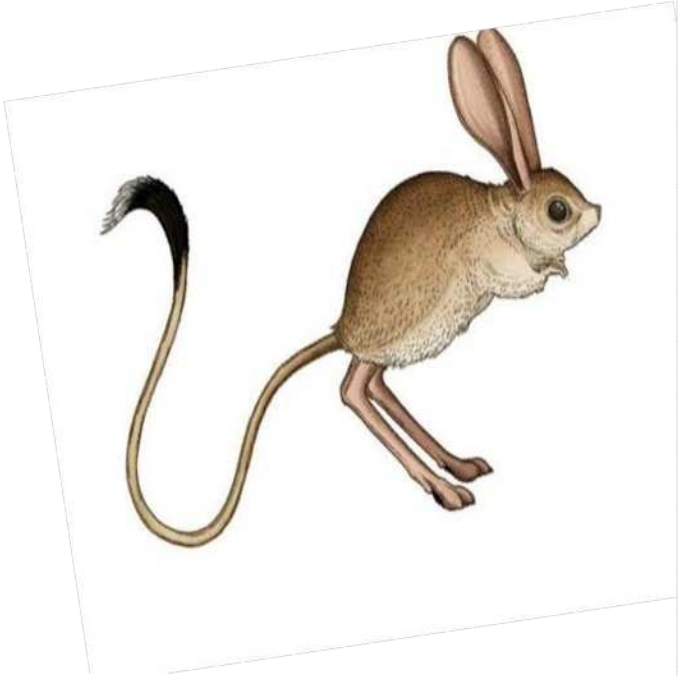
Concept two

Senses at work



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- **Senses at work**

❖ Living organisms have senses to *get information* from the surrounding and *communicate* with each other.

Sense.	*Sensory organ.*
Hearing	*Ear*
Sight	*Eye*
Smell	*Nose*
Touch	*Skin*
taste	*Tongue*

- Sometimes, senses become different in strength from animal to anther such as:

- 1- Owl: has extraordinary hearing and sight.
- 2- Dog: has extraordinary hearing and smell.

❖ The Egyptian mongoose make sounds to communicate with each other.

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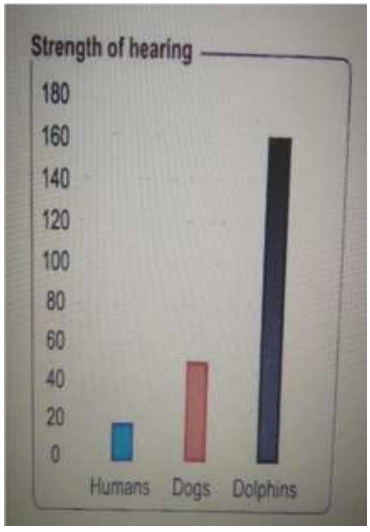
Dolphin super senses(hearing)

- Hearing is very important sense for all organisms.
- Sense of hearing help us to gather information from the surrounding environment.

- Living organisms are different in their hearing strength.

- Dolphins super senses help Them to:



1- *Survive.*
2- *Search for food.*
3- *Defend themselves.*

- Dolphin can hear all sound tones.

Complete the following?

- the sharpest sense that dolphin have is ……

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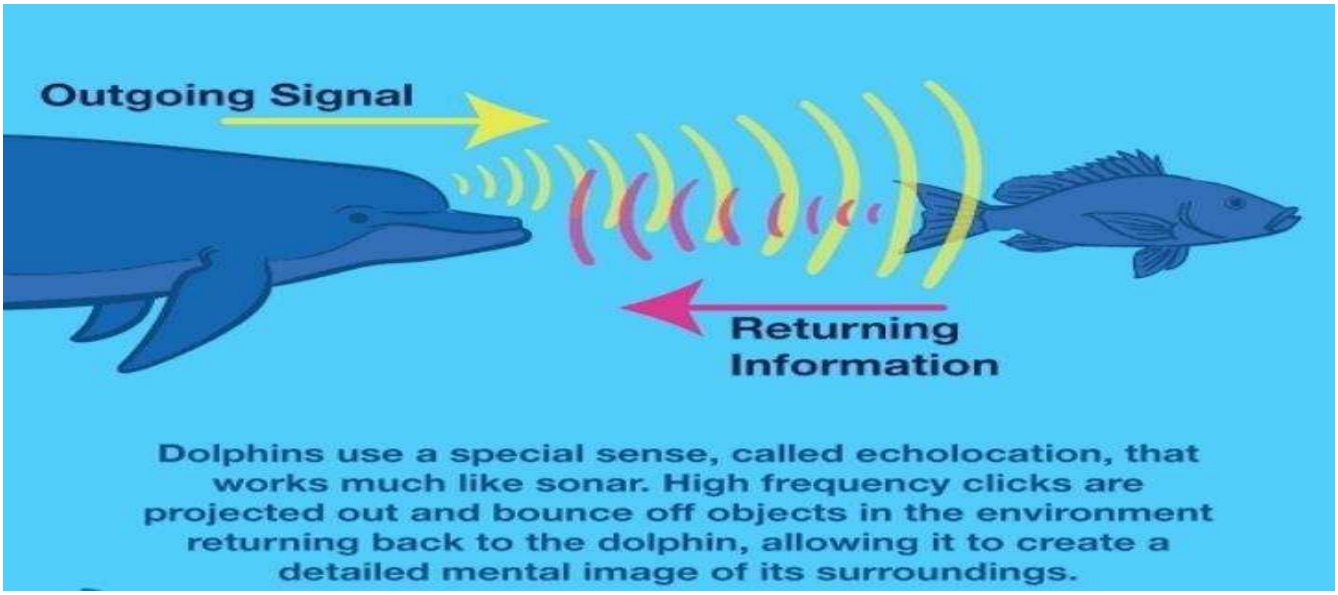
dolphin using echolocation: -

- dolphins depend on (*Echolocation*) to detect location of organisms in water.

Echo: reflecting sound waves back from solid objects to its source

 # how dolphin use echolocation?

1- Dolphin produce sound waves through water.
2- When sound waves hit any solid object, it reflects back to the dolphin in the form of echo .
3- In this way, dolphin can find its prey.


Outgoing Signal
Returning Information
Dolphins use a special sense, called echolocation, that works much like sonar. High frequency clicks are projected out and bounce off objects in the environment returning back to the dolphin, allowing it to create a detailed mental image of its surroundings.

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Examples on animal senses and their purpose:-

Animal	Sense	Purpose	Example
Fox	Hearing-Sight	Avoiding danger	Fox runs away from predators.
Chameleon	Sight-Taste	Searching for food	See and taste food.
Dog	Hearing-Smell	Recognizing friends	-Used in guarding. -Smell human scent.
Monkey	Five senses	Identifying things	Differentiate between things

Give reason:

1- We use dogs for guarding.

……

……

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Work sheet

Write the scientific term of each of the following :

1- The property that depends on the sense of hearing through which dolphins locate their preys under water. (…….)

2- The organ used to recognize different colors. (…….)

3- The organ used to recognize different odors. (…….)

4- The sense used to differentiate between smooth and rough surfaces. (…….)

5- The return back of sound waves on hitting a solid surface. (……..)

Correct the underlined words :

1- The dolphin has sharp sense of touch. (…….)

2- The dog uses its eyes to recognize odor of humans. (…….)

3- The fox uses its tail and ears to run away when it sees or hears its enemies. (…….)

4- Dolphins use camouflage property by using sound waves to hunt its preys. (…….)

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Lesson (2): super sensory organs

❖ Human cannot see clearly at night (darkness) but some animals can do called (nocturnal animals).

Nocturnal animals: animals that become active at night.

Why some animals become active at night?

1- Weather is cool during night (in hot regions).
2- Preys available at night only.
3- Use darkness to hide from preys.

1- Bat depend on *echolocation* to move like …….
It uses the echo to *locate its prey* in the dark.

2- Owls have extraordinarysenses of ……..&……..

Owl's face has:

1. Bowl-shaped face.
2. Special Feathers.

G.R

To ddirect distant sounds intoears.

So that owl can hear any movement within grass or under snow.

Owls have *large eyes* that allow them detect any tiny movement.

Owls can *rotate* their heads in all directions.

So that they can search for food everywhere easily.

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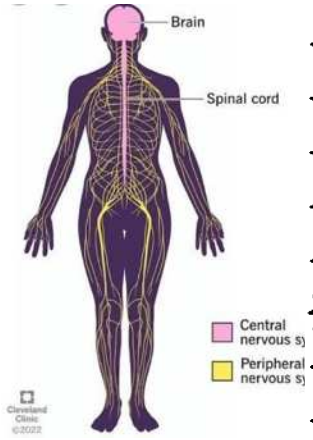
• The nervous system

• There is an ***integrity*** between nervous system and sensory organs. to help the organism collect information from the world.

- ***Mammals*** like human, elephant and dog are similar in the structure of nervous system.



▪ ***Nervous system consists of: -***

1- Brain. **2- spinal cord.** **3- nerves.**

1. **Brain:** the *main control center* of the body.

- It connected to spinal cord.

2. **Spinal cord**: carry message from **brain** to **body** and vice versa.
: ***group of nerves that passes through backbone.***

3. **Nerves:** transfer messages from brain to spinal cord through all the body parts and vice versa.

• the spinal cord connects brain with nerves which are distributed through the whole body.

Some nerves are connected directly to the brain like the nerves of eyes and heart.

- ***Nerves*** connect sensory organs to the brain.

• Sensory organs receive information from environment which transferred by nerves in the form of electrical impulses to the brain to be processed.

• Nerves of sensory organs are called sensory receptors.

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Sensing the environment

- ***Avoiding danger in human and animals:***

The parts of nervous system are responsible for sensation and delivering messages.

Both of human and animals respond to a danger but their reasons are different.

Jumping jerboa

- Egyptian jerboa from *desert rodents*
- Jerboa have :

1- *long hind legs:* help it jump long distance.

2- *feet and toes have hair* : to catch sand when it run.

3- *largeand sensitive* :*ears* help it to hear any movement.

a) *it hops in a zigzag path:* to run away quickly from danger.

- *Determine the type of adaptation in each point (1,2,3 and 4)?*

Structural (....,….,…..) **behavioral (……)**

- **All parts of jerboa`s body work together to avoid danger as t-he follow :**

When a snake makes a noise

1- Sensory receptorsin jerboa`s ears send message to the brain throughnerves.

2- The brain translates the message and respond by alerting legs to start moving.

3- The jerboa starts moving in a zigzag path using strong hopping legs.

- **Thewhole response process occurs in less than one second.**

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Reaction time: -

-The time taken to react to different information.

-the time taken to respond to danger.

Both human and jerboa depend on *sensory receptors, nerves* and *brain* to respond to danger and move away quickly for their safety.

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Work sheet

Choose the correct answer :

1) An animal that flies and depends on the bouncing of sound to catch its preys is a/an …… .

a. owl. b. snake. c. bat. d. dolphin

2) …..... can hear distant sounds due to their heads that look like bowls.

a. Owls b. Dogs c. Mongooses d. Chameleons

3) Bats and dolphins are animals that greatly different in size, but they have one thing in common as they both ……

a) live in the same environment.

b) feed on the same prey.

c) depend on echolocation property in their hunting.

d) depend on gills to breathe.

Give a reason for the following :

The nerves spread across the whole body.

……

Put (V) or (X) :

1) A dolphin produces sound waves so it can locate its prey through echo. ( )

2) The Egyptian mongoose makes a group of sounds that bounce back to it when it hits a wall or its prey. ( )

3) Nocturnal animals become active at morning to look for their food. ( )

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- *Lesson 3: Functions of nervous system: -*

1- Collecting information from inside and outside the body.

2- Translate the collected information.

3- Make a response depending on translation.

- *How the nervous system work?*
- *(example)*

1- When you hear someone calling you, sensory receptors of ears send signal to brain.

2- The brain process the sound waves.

3- The brain send signal to body to tell it what to do Such as turning around to know who is calling you.

- Reflexes: very fast messages that we cannot realize it: -

a- Moving your hand away when touching a very *hot cup.*

b- There is an automatic message sent from brain like signal breathe.

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Work sheet

Write the scientific term of each of the following :

1) The organ which receives and processes the messages sent from the sensory receptors that are found in a jerboa's ears.(… .....)
2) A system that works inside the body to keep the organism away from danger. (….....)
3) The time taken by an organism's body to react to different information around it. (….....)

What happens if .. ?

The bat produces sound waves that hit an insect.

……

Choose the correct answer :

1) The nervous system of……, such as elephants and dogs, consists of brain, spinal cord and nerves.

a. rodents b. birds c. mammals d. reptiles

2) …….. are nocturnal animals with bowl-shaped faces.

a. Owls b. Dogs c. Mongooses d. Chameleons.

3) If you are in your room, you can tell what kind of food is bei r prepared in the kitchen by using your sense of

a. sight. b. hearing. c. touch. d. smell.

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Lesson 4: animal's communication system.

- *Technology help human to communicate through:*
  - *a- Cell phone.*
  - *b- Text messages and e-mail.*

- *Animals don't use technology but they can communicate using other systems: -*

Ants colony

- Ants live in ***colonies*** that contain thousands of individuals.
- Ants are divided into groups: -

1- Nurse ants:they send smelly message to scout ants when the food amount is ***low.***

2- Scout ants: they search for food and send smelly message to tell other ants where to find food.

3- Soldier ants: they protect the colony in danger by sending smelly message to alert other ants.

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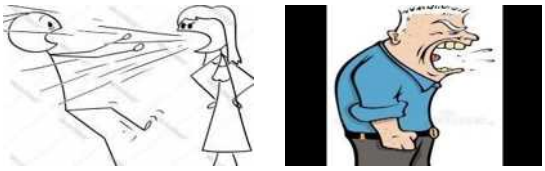
Humpback whales

- Humpback whales sing under water to communicate with each other.

- They sing a wide range of tones and series of songs.

- ***They sing different songs: -***
  1. During winter (mating season).
  2. During summer. (feeding season)

Sound pitch divided into:



1- High- pitched sound – sharp - soft – like voice of woman

2 Low pitched sound rough like voice of man .

Humpback whales change their sound pitch according to season as the following: -

1. In winter, their songs have high-pitched sound.
   - high-pitched sound travels better through cold water.

2. In summer, their songs have low-pitched sound.
   - Because low – pitched sound travels better through warm water.

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Technology inspired by nature.

- *Special cane: - used to help blind person.*

1- *It emits <u>high pitched sounds</u> **like bats.***
2- *When sound hit any solid object, it reflects back to the cane.*
3- *The echo turned into <u>vibrations,</u> that sensed by **<u>thump.</u>***
4- *This vibration tells the blind person if there is anything around him.*

Human cannot hear sounds that produced from <u>bats</u> and <u>special cane.</u>

	Special cane	***Bats***
Similarities	- *Both **emit high-pitched** ssound that bounce off objects.* - *Both **receive echo** to locate the obstacles*	
Differences	*Turn echo into vibration.*	*Don't turn echo into vibration.*

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Work sheet

Place each of the following animals in front of the sentence that describes it:

(Dolphins - Owls - Jerboas - Bats)

1- They can fly but cannot see well in the dark. (….....)

2- They are rodents that have long hind legs. (….....)

3- They are nocturnal birds with bowl-shaped faces. (….....)

4- They live in water and rely on echolocation to find food. (….....)

Give a reason for the following :

An owl can direct distant sounds to its ears.

……

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Concept three

Light and sight

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Light and sight.

Eye is the organ of sight that is affected by **light** in humans and animals.

- Humans cannot see in the dark, but they need light to collect information about what happen around them.

Vision in human and animals: -

Human eyes need light to see.

In absence of light we need *night vision goggle.*

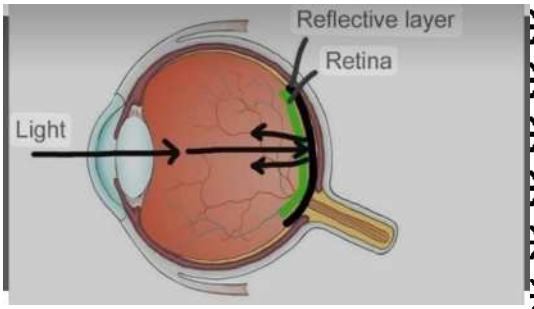
Some animals have a structural adaptation in their eyes ich help them to see at night such as (fishing cat)

It's a wild cat hunts during night. (nocturnal)

Its eyes seem to glow in the dark. G.R?

due to presence of mirror-like membrane on the back of eye.

When light enter its eyes, it reflects of this membrane to collect more light.



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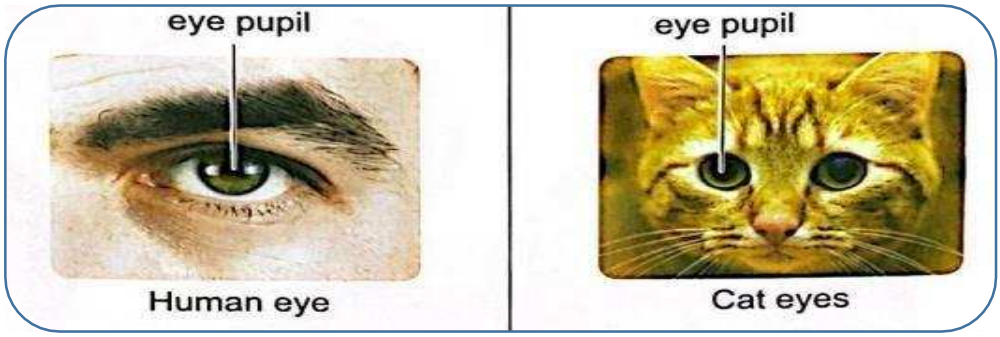
Human and nocturnal animals: -

1- Nocturnal animals have bigger eyes than human.
2- Eyes of nocturnal animals are more sensitive to light.
3- The pupils of their eyes open wider than human. G.R?
- To allow more light enter their eyes.

They can see well in weakest light level.
In complete darkness, they depend on other senses as hearing and smelling to hunt their preys or avoid their predators.



Source of light: -

- It is anything can emit its own light.

Ex: sun _ candle _ electric lamp _ fire - flash light.

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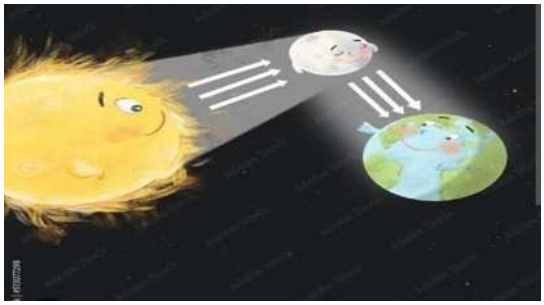
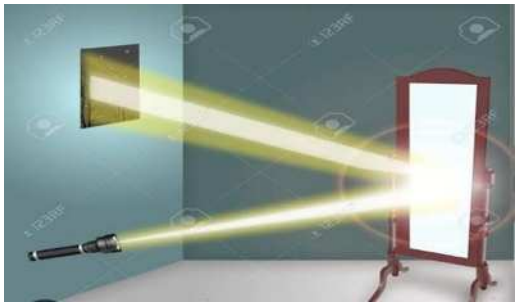
➢ *Moon* and *mirrors* are not considered as sources of light. G.R?

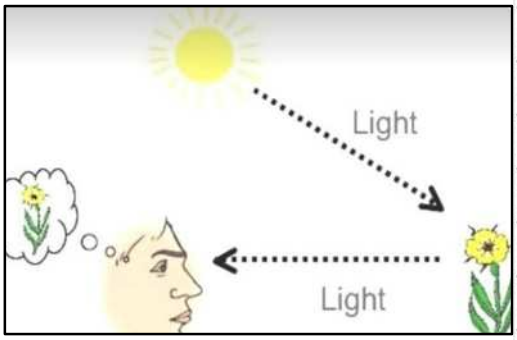
- Because they don't emit their own light but they reflect light.



- Moon reflects sunlight.



– mirror reflects flashlight.



How can we see?

Firstly, we need a light source then:

- Step one: Light rays fall on object.
- Step two: Light rays bounce off object and fall on eyes to see.

Light: the visible form of energy that travel in the form of ***waves.***

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Work sheet

Put (v) or (x) :

1) Eyes send information through nerves to the brain for processing them. ( )

2) The membrane that presents at the back of cat's eyes depends on sound to detect the prey location. ( )

3) Fishing cat has excellent night vision better than human.( )

Give a reason for the following :

The fishing cat's eyes pupils open widly at the low-light places.

……

Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Fishing cat 2. Human	a. depends on touch to hunt. b. has no mirror-like membrane at the back of the eye. c. has a mirror-like membrane at the back of the eye.

1- …….. 2- ……..

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2- Reflection of light:

- ***Returning back of light when it meets a reflecting surface.***

Type of material.	Shiny and smooth.	Rough.	Transparent.
Example	Metals and mirror	Plastic, wood, cloth and paper.	Glass.
Amount of reflected light rays.	Large amount.	Small amount.	Very small amount.

- ***Light strike matter: -***

- Light is a form of energy that always travels in a straight line.
- Light travels in the form of waves
- The behavior of light waves changed according to the type of matter.

When light hits an object

- Some of light is absorbed.
- Some of light may pass through it.
- Some of light reflects off surface.

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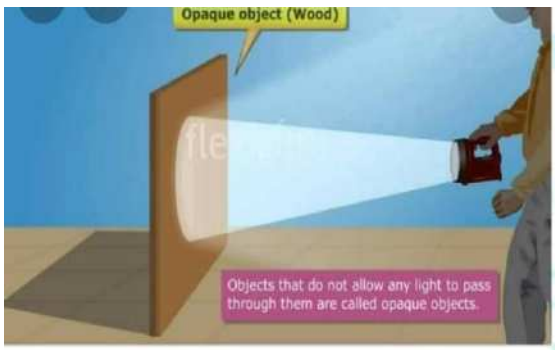
Examples on animal senses and their purpose: -

Opaque materials	Transparent materials
Materials that *don't allow* light pass through	Materials that *allow* light pass through
Objects *cannot be seen* through them	Objects *can be seen* through them
Plastic – wood -metals -human body	Air-water-windows-lenses
They *form shadows* in presence of light	They *don't form shadows*



- <u>Shadow</u>: dark area formed behind opaque materials

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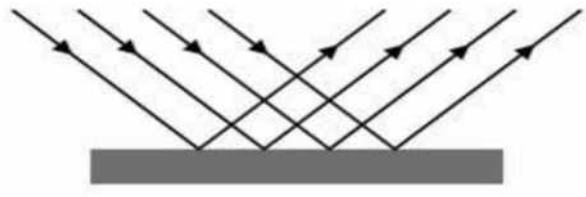
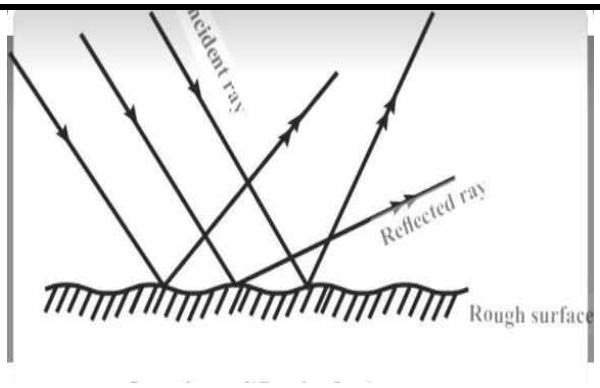
- Reflection of light depends on the smoothness of surface: -

Polished (smooth) surface.	Painted (rough)surface.
- Reflect light in one direction. (the same angle).	- Reflect light in different directions.
	

Rough surfaces scatter or diffuse light.

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Work sheet

Put (v) or (x) :

1) You can see a green ball inside a transparent glass box. ( )

2) Opaque objects allow light to pass through and we can see objects through them. ( )

3) In a completely dark room, we can see the transparent objects but opaque objects cannot be seen. ( )

Give a reason for the following:

You can see clearly through air.

……

Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Water	a. It is an opaque material, that reflects light in different directions.
2. Glass	b. It is a source of light energy.
3. Wood	c. It is a transparent material that is used in making windows.
	d. It is a transparent material which is used for drinking.

1- …….. 2- ……..…….. 3- ……

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Lesson. 3: Firefly light show.

Fireflies beetles: -

- They are small insects that can light up.
- Their light wings due to chemical reaction occur inside their bodies.
- They flash at regular periods of time.

- They use their wings to flash to: -
    1. Warn off other beetles from predators.
    2. Attract a mate to reproduce.

- Each group of fireflies beetles have their own flash pattern.

- To communicate with other group, they change their pattern to be matching with the other group pattern.

- human use light to communicate such as traffic lights.

Human	*Animals*	*Both of them.*
1. Reading 2. Writing 3. Watching T.V. 4. Cell phone 5. Electronic reader.	Echolocation	1. High and low pitched sounds. 2. Lights. 3. Movements.

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Work sheet

Put (V) or (x) :

1) Firefly beetles form different flash patterns by using their legs.
( )

2) Speaking is one of the ways to communicate with people.
( )

3) Light energy is not used by humans or firefly beetles for communication. ( )

Give a reason for the following :

The wings of firefly beetles play an important role in the communication between them.

Correct the underlined words :

1) Changing the flash patterns of firefly beetles is considered as a structural adaptation. (… .....)

2) A cell phone is a device that is used in communication between animals. (… .....)

3) Reading is a type of communication that depends on the sense of taste. (… .....)

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Lesson 4: transferring information

- Eyes depend on the light energy to collect information from the surrounding environment.

Eyes can detect and understand different signals: -

1. Someone waving at you.

2. When you see a red traffic light, your eyes send message to stop.

3. people use rescue flare to communicate.

4. People use fire to send signals over very long distance.

5. Many travelers use mirror (light reflecting surface) to send signal to get help.

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Code: -

- ***It is a pattern that has meaning.***

- *It's an information that transformed into another form :*

1- Thump up. (good)
2- Thump down. (bad)

3- Traffic lights.

4- Expressions of your face.

5- Language: code in the form of sound.

6- Writing: using letters to transmit information

(the meaning depend on the arrangement of letters in the word).

7- music(sounds): can be used in communication.

8- Lighthouses: send codes in the form of light to tell Sailors where they are.

The brain can decode and interpret the meaning of received code.

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Work sheet

Choose the correct answer :

1. All of the following use light energy to send codes, except …….. .

a. lighthouses. b. traffic lights.

c. musical instruments. d. firefly beetles.

2. Some living organisms can use light energy in communication such as …… .

a. humans only. b. firefly beetles only.

c. humans and firefly beetles. d. bats and firefly beetles.

3. The ……. is the only living organism that can use language and speech to communicate with each other.

a. whale b. owl c. firefly beetles d. human

Put (V) or (X) :

1) People who are lost in the desert can use mirrors to attract the attention of rescue helicopters. ( )

2) Writing is a type of communication that is used by human only. ( )

3) Musical instruments cannot be used to send codes for communication. ( )

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Unit 2

Starting and stopping

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Moving and static objects

- *To stop moving object or move static one, we need* ***a force.***

Force may be:

1- ***Pushing force****: moving objects away from you.*

2- ***Pulling force****: moving objects toward you.*

lock at the following and determine the type of force: -

…… …….. ……

- ***Truck & jet airplane: -***

1- Jet airplane fly much faster than truck. G.R?

Beca-use the engine of jet airplane is stronger than the engine of truck.

- ***Shock wave truck: -***

a- It is a truck fitted with ***<u>three</u>*** *jet engines.*

b- Its speed reach ***<u>500</u>*** *kilometer per hour.*

c- It is ***<u>five times</u>*** *faster than normal truck.*

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Stopping shockwave truck: -

- *The idea of stopping shockwave truck is* ***the same*** *idea that used in* ***rockets.***
- *Engineers supply it with* ***three parachutes.***
- *The driver opens parachutes to slow down the truck quickly.*

Moving objects: -

- ***Any object around us cannot move without force (push or pull).***
- ***Air can move the leaves of tree by the wind blowing.***

A cart with fire extinguishers

Some engineers fix fire extinguishers onto a cart.
The air moves backward so the cart start to move forward.

- What happen if we increase the number of extinguishers?

1. *The speed of cart will increase.*
2. *The distance that cart move will increase.*

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Work sheet

Write the scientific term of each of the following :

1) A force that you make to move an object toward you.

(.....)

2) A force that you make to move an object away from you.

(.....)

3) One of the fastest and most powerful trucks in the world.

(.....)

Give a reason for:

The Shockwave truck is faster than the normal truck.

.

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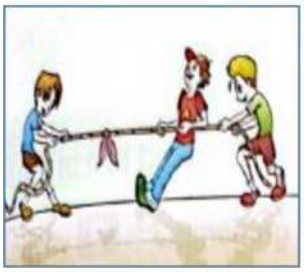
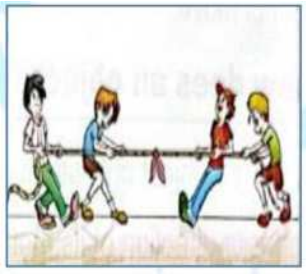
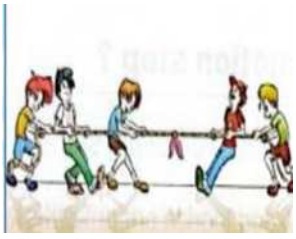
Balanced force: -

- *When two <u>equal</u> forces act on the body in different directions.*
- *The object will <u>not move</u>.*

- ***Unbalanced force: -***
  - *When two <u>unequal</u> forces act on the body in different directions.*
  - *The object will move toward the <u>stronger</u>(greater) force.*

Type: …… …… ……

Direction: …… …… ……

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motion: *change in the position of object relative to fixed point.*

- ***Explanation of motion: -***

1- If you are playing football with your friend.

2- The starting position of ball is ***close*** *to tree.*

3- The ball starts to move away from the tree due to the ***pushing force*** *of your hand.*

4- The ball will drop into your friend`s hand due to the ***pulling force*** *of* ***gravity.***

5- The ball will ***stop*** *due to* ***pushing force*** *of Your friend`s hand.*

☐ ***We can say that the ball in state of motion. G.R?***

- *Because its position changes relative to the tree.*

Gravity: the force that pulls objects toward the earth.

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Visible motion (easy to see): -

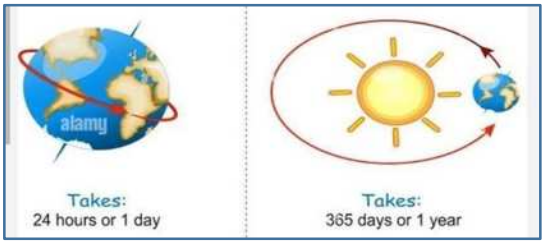
1- Walking person.

2- Moving cars.

3- Ball movement.

Some motion is hard to see: -

1- Rotation of earth around sun.



Force

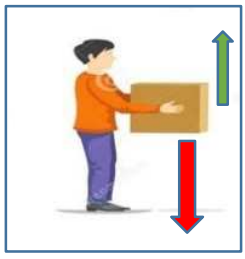
Force: pull or push that act on object to change its position.

When you are lifting a bag: -

The bag is affected by to forces: -

1- Pulling force of gravity. (downward)

2- Pulling force of your arm. (upward)



When you are sitting: -

- force of gravity is pulling you downward to hold you in the chair.

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Work sheet

Correct the underlined words:

1) To move up any object from the ground, the pulling force of your hand must be smaller than the pulling force of the gravity.

(……..)

2) In tug-of-war game, the winner team is the team with the weaker force. (…. .....)

3) You can stop the ball that is thrown toward you by the pulling force of your hands against the ball movement. (…. .....)

Give a reason for the following :

Parachutes are used in the Shockwave truck and rocket.

.....

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Stopping motion

➢ **To stop moving object: -**

- Force of the *same amount* act on the object
- in *opposite* direction of its motion.

We can observe stopping force easily: -

1- When car crashes into a wall.
2- The car will stop. G.R?

Because the wall applied force on the car equal to the force that move the car.

Sometimes it will be hard to observe stopping force: -

1- When the car runs out of fuel.
2- Its speed decreases gradually until it stops G.R?

- Due to the **friction force** between: -
  1- Car tires and road.
  2- Air and the car

Friction: *it is the force that arises when objects rub against each other.*

*1- Friction **slows down** or **stop** moving objects.*
*2- Friction force is always **opposite to** the direction of motion.*

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Rolling cars

If you push a toy car ***hardly.***

- *It will move* ***long*** *distance.*

If you push a toy car ***gently.***

- *It will move* ***short (small)*** *distance.*

If the same force act on two objects (car and truck):-

1- *The object that has* ***smaller*** *mass (car) will travel for* ***long*** *distance.*

2- *The object that has* ***bigger*** *mass (truck) will travel for* ***short*** *distance.*

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Work sheet

Put (V) or (X) :

1) The Shockwave truck has only one jet engine that makes it faster than the normal truck. ( )

2) The reason for stopping a toy car moves on a table is the friction between the toy car and the table surface. ( )

3) We can stop the motion of the Shockwave truck by using parachutes. ( )

What happens if ...?

A toy car and a toy truck are affected by the same pushing force.

……

……

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Lesson 4: energy, force and work.

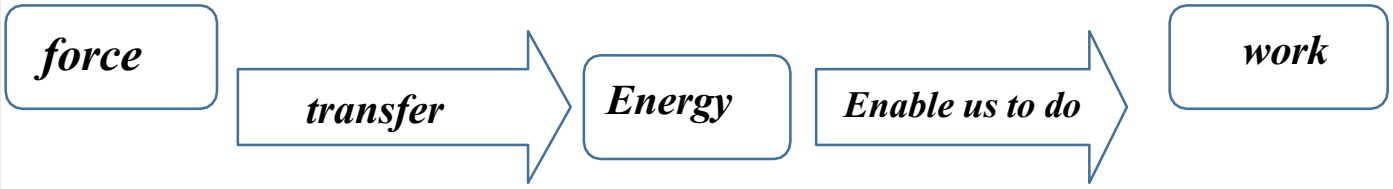
- To stop or move object, we need a force.
- To apply force to object, we need an energy.

When you push a car: -

1- Energy transfer from your body to the car.
2- If the car moved, you do work.

So that: -

1- The force transfer energy from one object to another.
2- The work done is equal to the amount of transferred energy.



*Force and energy are **different** but related to each other.*
*Force is the effect that transfer **energy** and convert it into **work.***

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Work sheet

Correct the underlined words:

1) The reason for standing of a cup on a table is that the pushing force of the table is more than the pulling force of gravity.

(……..)

2) The work done by the football is always less than the amount of energy transferred from the player foot to the ball.

(……..)

3) If the same force is applied on a large ball and a small ball, the large ball moves a distance longer than the small ball.

(……..)

Give a reason for the following :

When you let the ball out of your hand, it falls to the ground.

……

……

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Concept 2.2: Energy and motion

- Any moving object has ***kinetic energy.***

- Static objects don't have kinetic energy but they may have ***potential energy.***

Roller coasters

There are three states: -

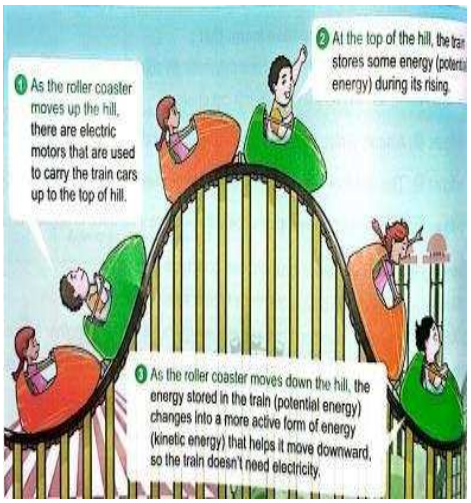
1- On moving up, the roller coaster depend on electric motor till the top of ramp.

2- At the top of ramp, the roller coaster stores **potential** energy.

3- On moving down, the roller coaster don't need electricity. G.R?

- Because potential energy is converted into kinetic energy.

Kinetic energy increases by increasing its speed.


1 As the roller coaster moves up the hill, there are electric motors that are used to carry the train cars up to the top of hill.
2 At the top of the hill, the train stores some energy (potential energy) during its rising.
3 As the roller coaster moves down the hill, the energy stored in the train (potential energy) changes into a more active form of energy (kinetic energy) that helps it move downward, so the train doesn't need electricity.

1 - What happens if roller coaster stops?

- Its kinetic energy become zero.

2 - What happens if roller coaster moves upward?

- Kinetic energy changed into potential.

3 - What happen if roller coaster moves downward?

- Potential energy changed into kinetic.

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Work sheet

Put (v) or (x) :

1) We eat food to obtain energy. ( )

2) Energy doesn't transfer from an object to another. ( )

3) When a stopped object is affected by two opposite equal forces, it will not move. ( )

4) If a wheelchair moves horizontally on the ground, its energy of motion equals zero. ( )

5) The moving objects only have energy, while the objects that don't move have no energy. ( )

Write the scientific term of each of the following :

1. The form of energy that the object has due to its movement.

(……)

2. The form of energy that increases when the speed of an object increases. (… .....)

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Lesson 2: - energy

- ***Importance of energy: -***

1- We get energy from food to help us ***grow*** and ***move.***
2- Energy ***affects*** the objects and change their ***positions.***
3- ***Operating*** all electric devices need electric energy.
4- Heat energy helps in ***cooking.***
5- Lighting houses and streets.

Transferring (moving) energy: -

- *Energy can transfer from one object toanother as the following: -*

1- When the player kicks the ball.

- Kinetic energy transfers from his foot to the ball.

2- Then the ball starts to move in the air. G.R?

- Due to transferring of kinetic energy to it.

3- When the ball gets inside the goal.

- Kinetic energy will transfer from the ball to the goal net.

4- The goal net will vibrate. G.R?

- Due to transferring of kinetic energy to it.

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• ***Energy inside stopped (static) object: -***

1- When the static object is on the ground.

- It has no potential energy.

2- When the static object is at height from the ground.

- It has potential energy.

Energy: it is the ability to do work or make change.

Work: it is the force that make object move a distance.

Some facts: -

1- Energy can be stored and change from one form to another.

2- Most of energy forms cannot be seen.

- Sound - electric - thermal – chemical

3- We cannot see most of energies but we can see and measure the effect of energy.

4- We cannot see sound, electric, thermal and chemical energies.

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Potential energy: ***{P.E}***

- *It is the energy stored inside object due to its*

Kinetic energy:{K.E} –

the energy of object due to its motion.

- *It is the energy that produced from object*

➢ *Potential energy can change into kinetic energy and vice versa.*

1- The boy on a tower has ***potential*** *energy.*

2- When he jumps down, ***P.E*** *converted into* ***K.E***

3-K.E transfer from boy to girl, and she pushed up into air.

4- During moving upward,***K.E*** is converted into ***P.E***

Object that has potential energy is ready to do work or to be active.

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Work sheet

Write the scientific term of each of the following:

1. The energy that is stored in an object due to its position at a certain height from the Earth's surface. ( )
2. The energy that the object gains due to its motion. ( )
3. The ability to do work or cause change. ( )
4. The force that makes an object move over a distance. ( )
5. The energy that is changed into kinetic energy when an object falls down to the Earth's surface. ( )

Correct the underlined words :

1. The ability to do force or cause change is known as energy.
   (……..)
2. We cannot see all forms of energy, except thermal energy.
   (……..)
3. As the object moves faster, its potential energy increases.
   (……..)
4. The energy form stored in a stopped wooden box placed on a table is kinetic energy. (…. .....)

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Lesson 3

Forms of potential energy:

1- Gravitational potential energy. (roller coaster)
2- Chemical potential. (battery)
3- Elastic potential. (compressed spring)

Factors affecting potential energy: -

1- Mass of object.
2- Height from the ground.

There is a direct relation between the potential energy and the mass &height of the object.

Forms of kinetic energy:

1- Sound.	Sound waves move in air.
2- Light.	Light waves move in air.
3- Electrical.	Electric moves through wires.
4- Thermal.	Particles of substance vibrate on heating.

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- Energy can be transferred from on object to another.
  Ex: when you kick the ball.
- Energy can be transformed from on form to another.
  Ex:

Device	Energy change	
	From	To
1-Flashlight	Chemical that stored in battery	Light and heat
2-Gas oven	Chemical that stored in natural gas	Thermal
3-Spring powered toy car.	Potential stored in spring	Kinetic, sound and thermal
4-Real car	Chemical energy in gasoline	Kinetic energy

Energy stored in many forms.

New energy cannot be created, and existing energy cannot be destroyed.

Food store chemical energy.

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Work sheet

Choose the correct answer:

1- The stored energy in a battery placed inside a flashlight can be changed into .....energies.

a. sound and light c. light and thermal

b. electrical and chemical d. chemical and kinetic

2- A bird flying in the sky has …… .

a. potential energy only.

b. kinetic energy only.

c. both potential and kinetic energies.

d. neither potential nor kinetic energies.

3. When a spring is compressed, it stores.....energy.

a. chemical b. potential c. thermal d. light

Give a reason for the following :

The stored potential energy in a battery differs from that of a ball at the top of a hill.

……

Put (V) or (x) :

1. Some forms of energy can be created and also can be destroyed.

( )

2. There is only one form of energy, which is the potential energy.

( )

3. Batteries stores electrical energy. ( )

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Easy life tool.

Tool name: robot hand.

Function: used to open jar cap

Source of energy: battery.

Chemical energy stored in battery. → Converted → Electric energy in the robot hand.

Electric energy in the robot hand. → Converted → Kinetic energy on moving hand.

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Work sheet

Complete the following sentences using the words below:

(kinetic - energy - chemical - potential)

1. Any type of ……. cannot be created or destroyed.
2. There are two types of energy which are kinetic and …….. energies.
3. When you kick a ball, your …….. energy is transferred to the ball.
4. The type of potential energy that is stored in batteries is called … ..... energy.

What happens if …?

Food burns inside the human body.

……

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Energy and collision

- when two objects *collide with* (hit) each other, we can observe that: -

energy

1- transfered
2- changed

Faster and heavier object → - Has more energy.
- Cause more dama.ge

Slower and lighter object → - Has less energy.
- Cause less damage.

MISS: WESAM GAD

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Wrecking ball

wrecking ball : very heavy steel ball that swing on a cable .
wrecking ball used to destroy buildings (depend on collision).

remember that: *Energy can transfer from object to another.*

Cricket game

Cricket is a popular game; the player uses a wooden bat to hit the ball.

- When a player hit the ball: -
  1. Kinetic energy transfers from bat to ball.
  2. Ball speed increase and its direction change.
  3. Some energy change into sound as (popping).

What happens when moving car stop suddenly and why?

- Passengers body continue to move forward.

Because → Body in state of motion stay moving until some force act on it.

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Safety equipment in cars

1) Seatbelts : used to keep driver and passengers bodies from moving forward when the car stop suddenly.

G.R : seatbelts saved thousands of lives. (answer above)

2) **Airbags** : made up from thin, nylon material.

1. Found folded into steering wheel , seats, dash board or doors .

Idea of operation:-

- **Modern cars contain sensor that can detect the crash.**
- **During collision, sensor make airbag inflate very fast and filled with gas to protect the passenger.**
- **After collision, airbag deflate due to vents in it .**

❖ ***Importance of airbags : -***

1. Absorb the energy of collision (make it soft).
2. Save many lives during accidents.

Collision between car and train.

Train will make more damage for car. G.R?

Because train is heavier and faster.

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Work sheet

Put (v) or (x):

1. Hitting a cricket ball with the bat causes a change in its speed and its direction. ( )
2. The wrecking ball is used to destruct walls of buildings. ( )
3. Transfering of kinetic energy occurs only through moving object to an object that doesn't move, when they collide together. ( )

What happens if ...?

The sensors of the car airbags detect a strong crash with the car's body.

……

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Energy and collision

We learned that during collision energy is *transferred* and *changed*.

Collision: time when two objects hit each other.

(collision of billiard-ball)

Now, let's see what happen when moving ball collide with another static one : -

1. *Kinetic energy **transfers** from moving to static ball.*
2. *Some of kinetic energy **changed** into sound and Heat energy.*
3. *Moving ball will **stop**, and static ball start to **move**.*

By the same way we can explain the energy transformation during collision.

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Basics of speed: -

$$Speed = distance \div time = \frac{distance}{time}$$

Speed: the distance covered in a certain time .

measuring units of speed	• kilometer per hour (kph - k/hr). • meter per second (m/s).
factors required to know the speed.	• distance . • time .

Problems

1. Saged buy new car that can travel *5 meters* in 5 seconds, calculate the speed of the car?

   Speed= ..... / ..... = ... / ..... = ... m/s.

2. Mohamed take ***2 hours*** to reach his school calculate the speed if you know that the distance he covered =***10 kilometers.***

   Speed= ..... / ..... = ... / ..... = ... kph.

:

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Comparing speed of two moving objects: -

1- If two moving objects move at equal periods of time: -

- The object which cover ***longer*** distance is ***faster*** ***(has greater speed)*** than other object that cover shorter distance.

2- ***If two moving object cover the same amount of distance: -***

- The object which travel the same distance in ***smaller*** amount of time is ***faster*** than other object which take more time.

Effect of speed on collision: -

fast object (more speed)	slower object (less speed)
has more energy (kinetic)	has less kinetic energ.y
- it exert more force. - cause more damage.	- it exert less force. - cause less damage

G.R: driving fast is very dangerous?

.....

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Work sheet

Choose the correct answer:

1- When a train travels 600 kilometers in 6 hours, what is the speed of the train ? ……..

a. 50 km/hr. b. 100 km/hr. c. 150 km/hr. d. 200 km/hr.

2- Which of the following speeds is the most dangerous on the driver's life on collision ? …….

a. a car moves at 25 km/hr.

b. a car moves at 50 km/hr.

c. a car moves at 75 km/hr.

d. a car moves at 100 km/hr.

3- The kinetic energy of an object sliding down on a ramp from height 2 meters is ……. that of the same object when sliding another ramp from height 4 meter.

a. less than b. more than

c. equal to d. faster than

Calculate the speed of a moving car, if you know that it covers a distance of 240 kilometers in 4 hours:

……

……

……

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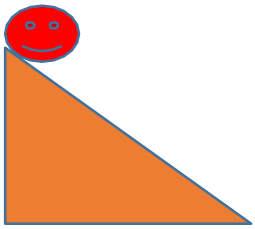
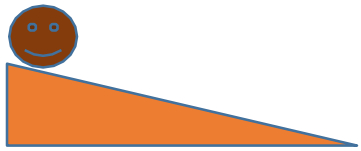
As angle of inclination increase → speed will increase → kinetic energy increase



(A)



(B)

The body in figure (A) will move faster and has more kinetic energy so it will move longer distance.

when large force act on object → its speed will increase.

Kinetic energy depends on: -

1- **Mass.**
2- **Speed.**

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Effect of direction during collision: -

Opposite direction.

More damage

The same direction.

less damage

G.R: we should keep distance from cars during driving.

- To avoid accident.

Complete the following:

1 .*Kinetic energy of the body depend on ……...and ……*

2. if speed of object increase, its kinetic energy ……..

3. force of collision depend on..... of both cars.

4. collision of two cars move in opposite direction cause..... damage Than collision of two cars move in one direction.

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Speed and Collision

As we learned in previous lessons: -

As the force acting on object increase, its speed will increase.

So its kinetic energy increase also.

What happen If you have a clay ball and threw it: -

- the amount of deformation depends on the force acting on the ball.
- When you let the ball without pushing, its shape change slightly.
- While let ball with pushing, cause more change in shape.

Relation between mass and kinetic energy

- **Small mass**
- **Small engine**
- **Consume less fuel.**
- **Less kinetic energy.**

- **large mass**
- **big engine**
- **Consume more fuel.**
- **More kinetic energy.**

Remember that

- ***Kinetic energy depends on speed and mass.***

If two objects have the same speed, the energy will depend on mass only.

What happen when bicycle and car move at the same speed and hit somebody?

- Car will cause more injuries due to its big mass (more energy).
- Bicycle will cause less injuries due to its small mass(less energy).

Complete the following : -

1. Car accident cause ..... injuries than bicycle accident.
2. When mass of object increase, its kinetic energy ……
3. Large truck uses.....amount of fuel .

G.R: large objects hurt more than small one.

.....

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Mass and Collision

By increasing the mass of object on a ramp, its speed will increase.

By increasing speed of object, its kinetic energy ……

Larger object (big mass) has more energy so, it can make powerful collision.

Smaller object (small mas) has less energy so, it makes a wea collision.

Speed and kinetic energy for object on a ramp depend on

1. *Angle of inclination.*
2. *Mass of object.*

By increasing angle of ramp, the speed of object ……

By decreasing mass of object, the energy will……

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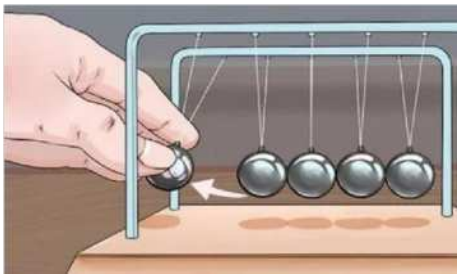
Transformation of energy during collision

Newton cradle :

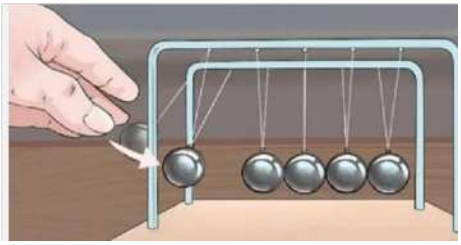
When you hold ball as figure:



The ball

1. store most potential energy
2. has no kinetic energy (static)

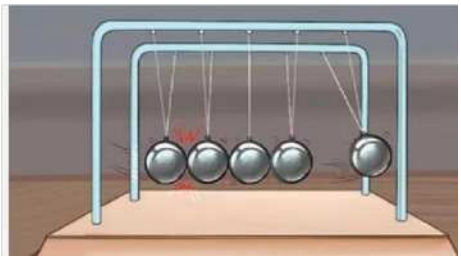
When you let the ball move:



Potential energy <u>Changes</u> into kinetic energy.

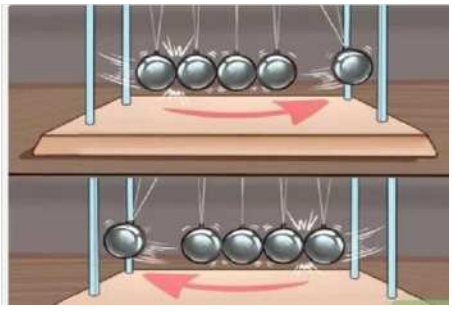
1. Potential decrease.
2. Kinetic increase.

During collision:



- ***Energy transferred gradually from each ball to the next one.***
- ***Number of balls on both sides is equal.***

Eventually :



- ***Some energy changes into sound and thermal energy.***
- ***Some energy lost due to friction between balls and string & (friction between balls with air)***

After a lot of collisions, balls will <u>stop.</u> **G.R ?**

Because part of energy lost in friction between balls and air.

Energy is conserved during collision (cannot be destroyed)

The amount of energy before collision = the amount of energy after collision.

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Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Large-mass vehicle with speed 100 km/hr	a. It has a big amount of kinetic energy.
2. Small-mass vehicle with speed 20 km/hr	b. It has no kinetic energy.
3. Small-mass vehicle that doesn't move	c. It has the most sound energy.
	d. It has a small amount of kinetic energy.

1. …… 2. …… 3. ……

Correct the underlined word :

1. A two-tons truck has <u>smaller</u> amount of kinetic energy than that of one-ton truck moving at the same speed. (….....)
2. All moving objects always have <u>light</u> energy. (….....)
3. The larger the mass of a car, the <u>less</u> fuel it consumes. (……)
4. The distance that the balls move on the two opposite sides on Newton's cradle <u>increases</u> gradually as time passes. (……)
5. In Newton's cradle, the kinetic energy of moving balls <u>increases</u> as time passes. (….....)
6. The number of moving balls at one side on Newton's cradle must be <u>more than</u> those moving at the other side. (….....)

1 **(A) Choose the correct answer :**

1. The mouth is an organ of ..... system.
   a. nervous b. digestive c. circulatory
2. Bats can locate their preys using .....
   a. smell. b. sight. c. echolocation.
3. Ants communicate with each other using .....
   a. sight. b. smell. c. touch.

(B) Look at the following pictures then determine the type of force (push – pull) :

1. .....

2. .....

2 **(A) Put (✓) or (✗) :**

From the examples of behavioral adaptation in panther chameleon is puffing up its body in danger. ( )

(B) Write the scientific term :

1. A type of foxes has a thick white fur. (.....)
2. The ability to do work. (.....)

3 **(A) Cross out the odd word :**

Brain – Nerves – Nose – Spinal cord. (.....)

(B) 1. Classify the following objects into opaque objects and transparent objects :

(Wood – Air – Water – Metal)

Opaque objects	Transparent objects
.....	.....
.....	.....

2. Calculate the speed of a car that travels a distance of 20 km every 2 hours.

.....

.....

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2 Cairo Governorate — Rod El Farag Educational Zone

1 (A) Complete the following sentences using these words :

(spinal cord – structural – stomach – gills)

1. Fish breathe in water by .....
2. From the components of the nervous system .....
3. The presence of fats under the animal's skin is a ..... adaptation.

(B) Give a reason for the following :

The seatbelt is one of the safety equipment in a car.

.....

.....

2 (A) Put (✓) or (✗) :

Humans use codes to transmit information. ( )

(B) What happens if ...?

1. Light falls on a smooth and shiny surface.

.....

2. Balanced forces act on a rest body.

.....

3 (A) Choose the correct answer :

..... is one of the light sources.

a. The moon b. The eye c. The Sun d. The mirror

(B) 1. Compare between the senses of hearing and sight (according to the organ responsible for each of them) :

Sense of hearing	Sense of sight
.....	.....
.....	.....

2. A train covers a distance of 600 km in 6 hours. Calculate the speed of the train.

The speed of the train = ... km/hour.

3 Cairo Governorate — Heliopolis Educational Zone

1 (A) Choose the correct answer :

1. When you jump high, the force affecting you must be .....

a. created. b. destroyed. c. unbalanced. d. balanced.

2. In the rainforests, we can find the .....

a. amphibians and fennec fox. b. panther chameleon and amphibians.

c. arctic fox and fennec fox. d. panther chameleon and arctic fox.

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3. The force that tries to stop an object moving on a surface is called .....

a. friction, b. gravity. c. pulling. d. magnetic.

(B) Look at the following figures then answer :

1. The surface in figure (a) is .....
and the light rays reflect in ..... direction.

Figure (a)

2. The surface in figure (b) is .....
and the light rays reflect in ..... directions.

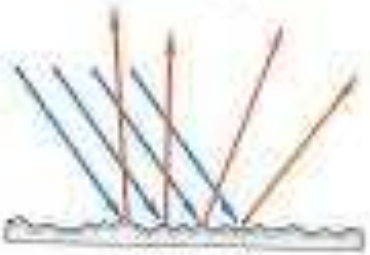


Figure (b)

2 (A) Put (✓) or (✗) :

Bats have the ability to change echo into vibrations as the cane of a blind person. ( )

(B) Give a reason for the following :

Electric lamp produces different forms of energy.

.....

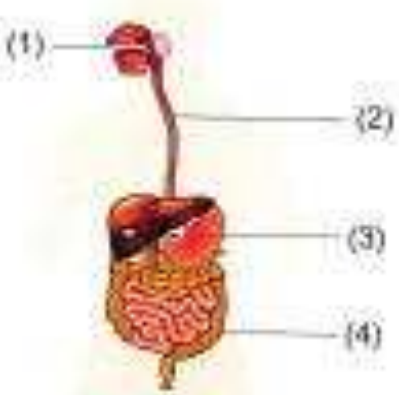
.....

(C) Look at the figure then answer :

1. Label the figure :

(1) ..... (2) .....

(3) ..... (4) .....



2. Complete the following :

a. The ..... absorbs water from the undigested food.

b. The ..... absorbs the nutrients through blood vessels.

3 (A) Correct the underlined word :

The spinal cord is the main control center in the body. (.....)

(B) Write the scientific term :

Change in the body structure of a living organism to survive. (.....)

(C) If a bus travels 100 meters in 20 seconds, calculate the speed of the bus.

.....

.....

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4 Cairo Governorate — Central Cairo Educational Zone

1 (A) Put (✓) or (X) :

1. Migration of some birds is a form of behavioral adaptation. ( )
2. The nervous system works independently of the five senses. ( )
3. Cardboard is considered a transparent material. ( )

(B) What happens if ...?

Balanced forces act on a stationary object.

.....

.....

2 (A) Choose the correct answer :

The system that provides the human body with oxygen and removes carbon dioxide is ..... system.

a. digestive b. respiratory c. circulatory d. nervous

(B) 1. How do bats communicate with each other?

.....

2. What is the type of energy produced in a roller coaster when it descends?

.....

3 (A) Complete the following sentence :

Facial expressions are a type of .....

(B) 1. Explain why : Animals do not eat the leaves of acacia trees.

.....

2. Calculate the speed of a car that covers a distance of 500 kilometers in 5 hours.

.....

5 Cairo Governorate — Mokattam Educational Zone

1 (A) Put (✓) or (X) :

1. Exhaled air contains more oxygen gas. ( )
2. The buttress roots of the kapok tree grow upward. ( )
3. The spinal cord is the main control center of the human body. ( )

(B) Give a reason for the following :

The speed of the car decreases when the brakes are applied.

.....

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2 **(A) Cross out the odd word :**

Stomach – Small intestine – Trachea – Esophagus. (.....)

(B) Complete the following sentences:

1. Echolocation helps dolphins to determine ..... of the prey.
2. The electric fan converts the electrical energy to ..... energy.

3 **(A) Choose the correct answer :**

The digestive system starts with .....

a. mouth. b. nose. c. anus.

(B) Write the scientific term :

1. The energy of an object due to its motion. (.....)
2. Living organisms communicate with each other through the sense of smell. (.....)

6 Giza Governorate — 6th October Educational Zone

1 **(A) Choose the correct answer :**

1. ..... trees grow in salt water.

a. Kapok b. Mangrove c. Palm

2. Some messages sent by the nervous system so fast that you cannot realize them known as ..... messages.

a. heart b. brain c. reflexes

3. Producing poison in acacia tree is considered as ..... adaptation.

a. behavioral b. structural c. physiological

(B) Calculate the speed of a car that travels a distance of 80 km every two hours.

.....

.....

2 **(A) Write what the following statement means :**

Pattern that has a meaning. (.....)

(B) What happens if ... ?

1. The body is affected by balanced forces.

.....

2. Fireflies don't emit flashes.

.....

3 **(A) Complete the following sentence :**

The property that enables bats to locate their prey is .....

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(B) Give reasons for :

1. The speed of the jet plane is greater than the speed of the truck.

.....

2. Humpback whales sing under water.

.....

7 Giza Governorate

Kerdasa Educational Zone

1 (A) Choose the correct answer :

1. When light falls on a mirror, it is .....

a. reflected. b. refracted. c. scattered. d. absorbed.

2. ..... cover(s) the body of the arctic fox.

a. Heavy hair b. Heavy skin c. Thick fur d. Many feathers

3. Animals that become active at night are called ..... animals.

a. diurnal b. nocturnal c. extinct d. endangered

(B) Write one example of :

Potential energy: .....

2 (A) Cross out the odd word :

Flashlight – Mirror – The moon. (.....)

(B) What happens if ...?

1. You switch on an electric lamp. (according to the change of energy)

.....

2. The hearing sense of humpback whales becomes weak.

.....

3 (A) Correct the underlined word :

Fish use gills to take carbon dioxide gas from water. (.....)

(B) Give reasons for :

1. You can't see an object placed behind a wood.

Because it doesn't allow .....

2. The Shockwave truck is faster than the normal truck.

Because it has ..... jet engines.

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8 Giza Governorate — Science Inspectorate

1 (A) Choose the correct answer :

1. From the structural adaptation of water lily plant is that it has _____
   a. long roots. b. needle leaves. c. wide leaves.
2. Reading and writing are common types of communication in ..... world.
   a. humans b. animals c. plants
3. The ..... of light helps to see yourself in the mirror.
   a. reflection b. absorption c. density

(B) What happens if ... ?

1. Your hand touches the spines of plant.

.....

.....

2. You pull an object.

.....

.....

2 (A) Cross out the odd word :

Small intestine – Stomach – Trachea – Large intestine. (_____)

(B) Write two examples of :

1. Forms of kinetic energy.

.....

.....

2. Safety equipment in the car.

.....

.....

3 (A) Correct the underlined word :

Humpback whales produce high-pitched sound in summer. (_____)

(B) Give reasons for :

1. Some animals make camouflage.
   To _____ from the enemies.
2. The book which is put on a table has energy.
   Because it stores _____

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9 Giza Governorate — Dokki Educational Zone

1 (A) Choose the correct answer :

1. The firefly beetle uses ..... to communicate.
   a. smell b. light c. echo
2. The animal that has the ability to turns its head in all directions is the .....
   a. owl. b. snake. c. dolphin.
3. Fish use ..... to breathe in water.
   a. tail b. eye c. gills

(B) Write an example of :

Safety equipment used during collision of cars.

.....

2 (A) Cross out the odd word :

Small intestine – Stomach – Trachea – Large intestine. (.....)

(B) What happens if ...?

1. The amount of food in the ants colony decreases.
   The ..... ants send ..... messages to scout ants to alert them to find the food.
2. You operate an electric fan.
   The ..... energy changes into ..... energy.

3 (A) Put (✓) or (X) :

The moon is a source of light. ( )

(B) Give a reason for the following :

1. Parachutes are used in the Shockwave truck.
   To help ..... their movement.
2. The penguin's body has a thick layer of fat and dense feathers.
   To keep its body .....

10 Alexandria Governorate — El-Montazah Educational Zone

1 (A) Choose the correct answer :

1. When an object is in motion, this means that its ..... changes.
   a. color b. shape c. size d. position
2. The tan-colored fur of fennec fox protects it from .....
   a. wind. b. rains. c. hot weather. d. cold weather.
3. When you move something towards you, this represents .....
   a. pushing force. b. light energy. c. pulling force. d. sound energy.

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(B) Give a reason for the following :

Owls can hunt during the night.

.....

.....

2 **(A) Put (✓) or (✗) :**

Seatbelt is one of safety equipment in cars. ( )

(B) Write the scientific term :

1. The type of energy that is affected by the height of objects. (.....)
2. Trees that grow in amazon rainforest. (.....)

3 **(A) Cross out the odd word :**

Penguin – Polar bear – Snake – Arctic fox. (.....)

(B) Complete the following statements :

1. The dolphin has sharp sense of .....
2. Fish breathe ..... gas which dissolves in water.

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